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The Impact of Inflation, Exchange Rate, Interest Rate, World Oil Prices and World Gold Prices toward Mining Sector Index Movement

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Abstract:- This study aims to analyze the effect of Inflation, Exchange Rate, Interest Rate, World Crude Oil Prices and World Gold Prices on the volatility of Mining Index on Indonesia Stock Exchange. Sample taken in this research are monthly data of Inflation, Exchange Rate, Interest Rate, World Crude Oil Prices, World Gold Prices and Indonesia Mining Index period of 2014-2018. The method of analysis used in this study is multiple linear regression (time series data). The result showed that partially World Crude Oil Prices having significant positive effect on the volatility of Mining Index, while Exchange Rate and World Gold Prices are not having significant influence on the volatility of Mining Index. The implication in this study is that investors need to pay attention about the changes of World Crude Oil Prices, because it is proven to have a positive effect on volatility of Mining Index.

Keywords:- *Mining Index, Inflation, Exchange Rate, Interest Rate, World Crude Oil Prices, World Gold Price.*

I. INTRODUCTION

The capital market is currently experiencing rapid development and plays an important role in driving the economy and mobilizing funds from people who want to invest in the capital market. In carrying out its economic function the capital market moves funds from parties who have excess funds to those who need funds. Thus, the capital market can be interpreted as a place to trade securities, and a place to trade securities called the stock exchange. Stock Exchange is the physical meaning of the capital market. (Eduardus Tandelilin 2010: 26).

The capital market has increased (bullish) or decreased (bearish) as seen from the rise and fall of listed stock prices which is reflected through an index movement or better known as the Composite Index. Composite Index is a value used to measure the combined performance of all shares (companies/issuers) listed on the Stock Exchange. The movement of the index is strongly impacted by investors' expectations on the condition of the country's and global fundamentals.

The Sectoral Index is one of the indices on the Indonesia Stock Exchange that the Mining sector is one of an investment choices. Investors who wish to invest through the capital market in the mining sector must pay attention to movements in the mining sector stock price index.

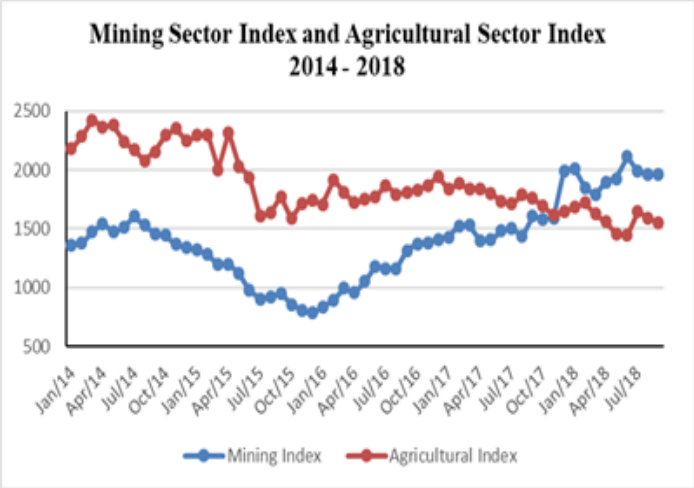

Fig 1:- Chart of Mining index and Agriculture Index Movement

In Figure 1 above, it shows that the Agriculture Sector Index from 2014 to 2018, there was a downward movement, meanwhile in the Mining Sector Index there were two opposite movement trends, at the beginning of 2015 to the end of 2015 there was a bearish/down trend, and from the beginning of 2016 until 2018 there was a bullish/upward trend. This phenomenon is very interesting, because it can be used as material for analysis in determining what factors impact the changing trends.

Apart from the above phenomena, there are several other things that cause the mining sector to be very interesting to be used as material for analysis, including the fact that the results of processing the mining sector are the main raw material in the production process in other industries/sectors, then in 2016, the sector mining is the largest contributor to Non-Tax Government Revenue which reaching Rp90 trillion and there is also the biggest decline in capitalization in the history of mining companies, from Rp255 trillion on 31 December 2014 to Rp161 trillion on 31 December 2015.

Several factors that cause fluctuations in the ups and downs of this index are macroeconomic conditions and world commodity prices. Capital market performance is impacted by macroeconomic conditions such as inflation,

exchange rates, interest rates, and world commodity prices such as world oil prices and world gold prices.

In research related to the impact of inflation, exchange rates, interest rates, world oil prices, and world gold prices on stock index movements, a research gap is still identified whereas the results of some previous studies tend to be inconsistent or different between one researcher and another.

The results of Patel's (2012) study stated that inflation has a positive effect on index movements. This result is contrary to research conducted by Suyati (2015), Dewi (2014) and Hidayat (2017) which states that inflation has a negative effect on index movements, and also different from research conducted by Anisa (2018) and Sambodo (2014) which states that inflation has no effect on index movements.

The results of Suyati's (2015) study stated that exchange rates have a positive impact on index movements. This result is contrary to the research of Dewi (2014) and Sambodo (2014) which stated that exchange rates have a negative effect on index movements, and also different from studies conducted by Anisa (2018) and Hidayat (2017) which stated that exchange rates have no effect on the movement of the index.

Hidayat's research results (2017) stated that interest rates have a positive effect on index movements. This result is contrary to the research of Ika Anisa (2018), Dewi (2014) and Sambodo (2014) who stated that interest rates have a negative effect on index movements, and also different from studies conducted by Suyati (2015) that interest rates are not affect the index movement.

The results of Patel's (2012) and Monjazeb (2014) research stated that the oil price has a positive effect on index movements. This result is different from the research conducted by Anisa (2018) that the oil price has no effect on the index movement.

Anisa's research results (2018) and Patel (2012) stated that the gold price has a positive effect on index movements. This result is contrary to the research of Monjazeb (2014) which stated that the gold price has a negative effect on the movement of the index, and also different from the research conducted by Sambodo (2014) that the gold price has no effect on the movement of the index.

From the description above, the research problems can be identified as follows:

- There are significant fluctuations, a downward trend as well as an upward trend in the mining sector index between 2014 and 2018.
- There is still a contradiction between one researcher and the other researchers, especially regarding the research results.

Based on the description of the background above, the research problems as follows:

- Does inflation affect the movement of the Mining Sector Index?
- Does the exchange rate affect the movement of the Mining Sector Index?
- Does the interest rate affect the movement of the Mining Sector Index?
- Does the world oil price affect the movement of the Mining Sector Index?
- Does the world gold price affect the movement of the Mining Sector Index?

II. LITERATURE REVIEW

A. Arbitrage Pricing Theory (APT)

Arbitrage Pricing Theory (APT) was first introduced by Ross in 1976 in which he stated that the price of an asset could be impacted by several factors, and two investment opportunities that have identical properties cannot be sold at different prices. In this case the law adopted by APT is the law of one price. APT describes the relationship between risk and return, but using different assumptions and procedures. If an asset with the same characteristics (identical) if sold at different prices, then there will be an opportunity to arbitrage by buying assets that are cheap and at the same time selling them at a higher price so as to obtain profits without risk (Pratikno, 2009).

B. Inflation Theory

Inflation is a process of increasing prices in general and is continuously related to market mechanisms that can be caused by several factors. In other words, inflation is also a process of continuously decreasing the value of a currency. In general, theories that discusses inflation can be divided into three groups, namely:

- *Quantity Theory*

The Quantity Theory in principle says that the onset of inflation is caused by the increase in the amount of money in circulation and the public perception/assumption that prices will rise.

How to deal with inflation according to this theory can only be done by reducing the amount of money in circulation.

- *Keynes's Theory*

In his theory, Keynes states that inflation occurs because people want to live beyond their economic capacity. This situation is shown by the people's demand for goods that exceed the amount of goods available. This raises the inflationary gap and as long as the inflationary gap persists, so the inflation process occurs and continues.

- *Structuralist Theory*

Structuralist theory is a theory that explains the phenomenon of inflation in the long run, because it highlights the causes of inflation that originate from the economic structure, especially food supply and exported

goods. Increased production of goods is not proportional to the growth in needs, resulting in an increase in food prices and scarcity of foreign exchange.

C. Exchange Rate

Exchange rate is a currency value agreement between two currencies of each country or region. Trade between countries where each country has its own means of exchange requires that there is a comparison of the value of a currency with other currencies, called a foreign exchange rate or exchange rate (Salvatore, 2008). The exchange rate is divided into nominal exchange rates and real exchange rates. Nominal exchange rate is the value someone uses when exchanging one country's currency with another country's currency. While the real exchange rate is the value someone uses when exchanging goods and services from one country with goods and services from other countries.

D. Interest Rate

Interest rate is the price of the use of money or can also be called rent for the use of money for a certain period and is usually expressed in units of percent (%). Whereas bank interest can be interpreted as a price to be paid to customers who have deposits and must be paid by customers who obtain loans (Kasmir 2002: 121).

E. World Oil Price

The world oil price is one of the factors affecting the world's markets, including in Indonesia. As we know, almost all economic activities require energy or fuel, both to run production machinery, produce electricity or as a means of transportation where almost all of the fuel comes from oil. Thus it can be said that oil plays an important role for the economy. The increase in world oil prices tends to have a negative impact on the performance of the industrial sector, where an increase in World Oil Prices will make an increase in the production costs of a company and have an impact on rising product selling prices (Firdaus et al., 2011).

F. World Gold Price

Gold is a precious metal that is loved and hunted by humans, so the price always increases. At present, gold is believed to be one of the commodities used as an investment tool because in addition to prices that tend to rise, gold is also liquid because it can be accepted in any country. According to Sunariyah (2003), one form of risk-free investment is gold. For investors, when making investments, they prefer investments with high returns with a certain level of risk or certain returns with low risk.

G. Mining Sector Index

The Mining Sector Index is an indicator that shows the movement of prices of shares incorporated in the mining sector within a certain time period. The index value is impacted by the price of the shares in the index portfolio and the weight of each stock. The more shares outstanding and the greater the value, the greater the weight of the stock in influencing the index movement.

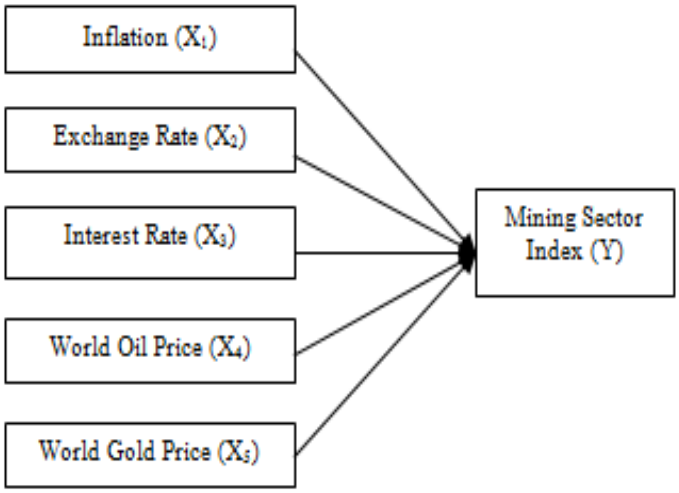

Fig 2:- Research Model

Based on empirical studies that have been carried out, the following hypothesis can be drawn:

- H1: Inflation has a negative effect on the movement of the Mining Sector Index.

This hypothesis is strengthened by the results of research by Pervaiz et al. (2018), Dwita and Rahmidani (2012), Suyati (2015), Amrillah (2016), Sudarsana and Candraningrat (2014) and Hidayat et al. (2017).

- H2: Exchange rates have a negative effect on the movement of the Mining Sector Index.

This hypothesis is strengthened by the results of research by Robiyanto (2018), Yunita et al. (2018), Hutapea et al. (2018), Sambodo (2014), Andes et al. (2017), Amrillah (2016), Sudarsana and Candraningrat (2014), Adnyana et al. (2017) and Meta (2006).

- H3: Interest rates negatively affect the movement of the Mining Sector Index.

This hypothesis is strengthened by the results of research by Ahmad et al. (2010), Barakat (2016), Ozlen & Ergun (2012), Ozbay (2009), Robiyanto (2018), Hantono and Girsang (2016), Setyaningrum and Muljono (2016), Anisa and Darmawan (2018), Sambodo (2014)), Purnomo and Widyawati (2013), Sudarsana and Candraningrat (2014), Zulelli and Yusniar (2013) and Meta (2006)

- H4: World oil prices have a positive effect on the Movement of the Mining Sector Index.

This hypothesis is strengthened by the results of research by Monjazeb & Shakerian (2014), Patel (2012), Kalyanaraman & Tuwajri (2014), Ozcan (2012), Hussin et al. (2013), Handiani (2014), Hutapea et al. (2014), Pardede et al. (2016), Purnamasari and Sukmana (2017) and Lawrence (2013).

- H5: World Gold Prices have a positive effect on the Movement of the Mining Sector Index.

This hypothesis is strengthened by the results of research by Patel (2012), Ozcan (2012), Anisa and Darmawan (2018), Handiani (2014), Yunita et al. (2018), and Purnamasari and Sukmana (2017).

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III. METHODOLOGY

This research is a type of research with analytical quantitative analysis. Quantitative research methods can be interpreted as positivistic methods because they are based on the philosophy of positivism and are used to examine specific populations or samples.

In terms of explanation, this research is an associative study with a form of causal relations. According to Sugiyono (2013), causal relationship is correlation between cause and effect. Hence, there are independent variables (impact) and dependent variables (impacted). This means that this study aims to examine the effect of independent variables namely inflation, exchange rates, interest rates, world oil prices and world gold prices on the dependent variable, namely the Mining Sector Index.

Population is a generalization area consisting of; objects or subjects that have certain qualities and characteristics determined by researchers to be studied and then conclusions drawn (Sugiyono, 2014: 115). The population in this study is the entire Mining Sector Index data from 1996 to present which is around 252 monthly Index data.

If the population is very large, then it is not possible for researchers to learn everything in the population, for example due to limited time, energy and funds. To overcome this, a sample was taken from the population. According to Sugiyono (2013), the sample is part of the number and characteristics possessed by the population, which later is expected to represent the entire population. The sample in this study is monthly data Inflation, Exchange Rates, Interest Rates, World Oil Prices, World Gold Prices, and Mining Sector Index in the period of January 2014 to September 2018 totaling 57 data.

The type of data used in this study is quantitative data, based on the data source this study used secondary data with the type of montly data time series over a period of 57 months from January 2014 to September 2018. Secondary data sources are sources that are not directly providing data to data collectors, for example through other people or through documents (Jogiyanto, 2003).

The data analysis method used in this study is multiple linear regression with time series data types which used to determine the effect of inflation, exchange rates, interest rates, world oil prices and world gold prices on the movement of the Mining Sector Index.

To observe to what extent the impact of the independent variables on the dependent variable, the following regression line equation is used:

$$Yt = a + b_1X_{1t} + b_2X_{2t} + b_3X_{3t} + b_4X_{4t} + b_5X_{5t} + e \ldots\ldots(1)$$

Where:

Y = Mining Sector Index
a = Constant
b_i = Regression line coefficient
X_1 = Inflation
X_2 = Exchange rate
X_3 = Interest rate
X_4 = World Oil Prices
X_5 = World Gold Prices
t = Time Series
e = Standard Error

IV. RESULTS AND DISCUSSION

Descriptive analysis used to obtain comprehensive picture of the variables used in the study, both the dependent and independent variables. Descriptive statistics in this study use time series analysis with linear trend patterns.

Before modeling or processing data, it is necessary to know whether the data used is stationary or not. To find out the stationarity of the data, the unit root test method is used, namely the Augmented Dickey Fuller (ADF) test.

In general, regression using time series data is not stationary, therefore the transformation of the data is made into a first difference form to ensure the data becomes stationary.

The normality test aims to test whether in the regression model, confounding or residual variables have a normal distribution. A satisfactory regression model is one that has a normal or near normal distribution.

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		56
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	87.45064241
Most Extreme Differences	Absolute	.088
	Positive	.088
	Negative	-.064
Test Statistic		.088
Asymp. Sig.		.200[c,d]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

Table 1:- Normality Test

The results of normality testing appears that the residual (error) spread normally because the value of sig = 0.200> 0.05, so the normality assumption is fulfilled.

Multicollinearity test aims to test whether the regression model found a correlation between independent variables. A satisfactory regression model should not occur correlation between independent variables. One way to analyze the presence or absence of the impact of multicollinearity in this study is by observing the value of Variance Inflation Factor (VIF) using the SPSS 23 program. A data can be said to be free of multicollinearity symptoms if it has a VIF value of less than 10 and a tolerance value of more than 0.1.

Coefficients[a]			
Model		Collinearity Statistics	
		Tolerance	VIF
1	d.Inflation	.945	1.058
	d.Exchange rate	.889	1.124
	d.Interest rate	.969	1.032
	d.World oil prices	.936	1.069
	d.World gold prices	.922	1.084
Dependent Variable: Mining Sector Index			

Table 2:- Multicollinearity Test (Variance Inflation Factor)

Table 2 shows that the VIF value from the multicollinearity test results for each independent variable <10 and the tolerance value is greater than 0.1. So it can be concluded that all independent variables of this regression model do not have multicollinearity problems. This shows that the regression model is feasible to use because there are no variables experiencing multicollinearity.

Heteroscedasticity test aims to test whether in the regression model there is an inequality of variance from the residuals of one observation to another observation.

Coefficients[a]		
Model		Sig.
1	(Constant)	.000
	d.Inflation	.396
	d.Exchange rate	.384
	d.Interest rate	.531
	d.World Oil Prices	.111
	d.World Gold Prices	.684
Dependent Variable: Abs_RES		

Table 3:- Heteroscedasticity Test (Glejser)

Heteroscedasticity test results in Table 3 shown that the significance values for all variables > 0.05, so heteroscedasticity is not present in this model and means that the regression model used for this study is feasible.

The autocorrelation test aims to test whether in the regression model there is a correlation between the residual in period t and the residual in period t-1. This problem arises because residuals are not free from one observation to another.

Model Summary[b]		
Model	R Square	Durbin-Watson
1	.142	2.075
Dependent Variable: Mining Sector Index		

Table 4:- Autocorrelation Test

Referring to the autocorrelation test results obtained Durbin-Watson (DW) = 2.075. The dL & dU values in the Durbin-Watson table for k = 5 and n = 56 are the lower limit of dL = 1.381 and the upper limit of dU = 1.767. While the magnitude of 4 - dU = 2.233 and 4 - dL = 2.619

Referring to the values obtained it can be concluded that the Durbin-Watson test is between du and 4-dU (1,767 < 2,075 < 2.233), so it can be concluded that autocorrelation does not exist and

means that this model is free from autocorrelation problems (no autocorrelation).

Multiple Linear Regression Testing is used to determine the magnitude of the impact of some independent variables on the dependent variable. The results of the analysis can be seen in the following table:

Variable	Coefficient	t-Statistics	Prob (Sig.)
Constant	17.413	1.34	0.186
d.Inflation	6.297	0.323	0.748
d.Exchange Rate	-0.071	-1.202	0.235
d.Interest rate	6.621	0.118	0.907
d.Oil Prices	5.637	2.253	0.029
d.Gold Prices	0.107	0.392	0.696
R=0.142 ;	F-Statistic = 1.654	; Prob (F-Statistic) = 0.163	
Source: Processed by Researcher			

Table 5:- Multiple Linear Regression (5 Variables)

Referring to the regression results above, when seen from the Prob (F-Statistic) value of 0.163 in this model, it is still greater than the 0.05 significance level, so it has not met the feasibility test of the model. Therefore, in order to meet the feasibility test of the model, the inflation and interest rate variables will be excluded from the study and re-tested.

The basis for the selection of variables issued is the inflation and interest rates because these two variables have a significance level well above 0.05 (t-test) and are also higher when compared to other independent variables, amounting to 0.748 for inflation and 0.907 for interest rate variables.

Variables	Coefficeint	t-Statistics	Prob (Sig.)
Constant	16.377	1.327	0.19
d.Exchange rate	-0.068	-1.186	0.241
d. Oil Prices	5.48	2.269	0.027
d. Gold Prices	0.115	0.435	0.666
R=0.140 ;	F-Statistic = 2.820	; Prob(F-Statistic) = 0.048	
Source: Processed by Researcher			

Table 6:- Multiple Linear Regression (3 Variables)

After repeated testing, it can be seen that the Prob (F-Statistic) value of 0.048 is smaller than the significance level of 0.05, so it can be said to have fulfilled the model feasibility test (feasible to be used to explain the effect of independent variables on the dependent variable).

From the results of the regression, the regression equation model can be obtained as follows:

Mining Sector Index = 16.377 - 0.068 d. Exchange Rate + 5.48 d. World Oil Price + 0.115 d. World Gold Price

The equation explains:

- *Constant = 16.377*

The value of the positive constant indicates that if the value of each independent variables (Exchange Rates, World Oil Prices and World Gold Prices) = 0, the movement of the Mining Sector Index (Y) will increase by 16.377.

- *The exchange rate (X1) = -0.068*

Represents the value of the regression coefficient of the Exchange Rate variable against the movement of the Mining Sector Index. If there is an increase in the Exchange Rate variable by one unit, the Mining Sector Index (Y) variable will decrease by 0.068 and vice versa, assuming the other variables are constant.

- *World Oil Prices (X2) = 5.48*

Represents the value of the regression coefficient of the World Oil Price variable on the movement of the Mining Sector Index. If there is an increase in the World Oil Price variable by one unit, the Mining Sector Index (Y) variable will increase by 5.48 and vice versa, assuming the other variables are constant.

- *World Gold Price (X3) = 0.115*

Represents the value of the regression coefficient of the World Gold Price variable on the movement of the Mining Sector Index. If there is an increase in the World Gold Price variable by one unit, the Mining Sector Index (Y) variable will increase by

0.115 and vice versa, assuming the other variables are constant.

Table 6 shows that the R-Square Value (R2) of 0.140 shows that the proportion of the impact of the independent variable (Exchange Rates, World Gold Prices and World Oil Prices) on the dependent variable (Mining Sector Index) is 14%, while the remaining 86% impacted by other variables out of this study.

Variables	Identified Impact	Significancy (5%)
d.Exchange Rate	Negative (-)	Not Significant
d.Oil Prices	Positive (+)	Significant
d.Gold Prices	Positive (+)	Not Significant

Source: Processed by Researcher

Table 7:- Correlation between Independent and Dependent Variable

The first hypothesis aims to examine the existence of a (significant) negative effect of exchange rates on the movement of the Mining Sector Index. Regression results show that exchange rate does not have effect (not significant) on the movement of the Mining Sector Index. This is not in accordance with the hypothesis that was built at the beginning, or in other words the initial hypothesis was rejected. The results of this study are in line with the results of the studies of Hantono and Girsang (2016), Setyaningrum and Muljono (2016), and Anisa and Darmawan (2018) who stated that Exchange Rates had no effect on the Mining Sector Index. These results indicate that a change in Exchange Rates does not have a significant impact on the movement of the Mining Sector Index, which is likely due to the period 2014 to 2018, changes in Exchange Rates are not too large so they do not have an effect on the capital market in Indonesia.

The second hypothesis aims to examine the (significant) positive effect of world oil prices on the movement of the Mining Sector Index. Regression results show that world oil prices have a positive (significant) effect on the movement of the Mining Sector Index. This is consistent with the hypothesis that was built at the beginning, or in other words the initial hypothesis was accepted. The results of this study are in line with the results of research by Patel (2012), Ozcan (2012), and Pardede et al. (2016), which states that world oil prices have a positive effect on the Mining Sector Index. These results indicate that the movement of the Mining Sector Index will move in harmony with the volatility of world oil prices, which is due to the fact that several listed companies that are members of the Mining Sector Index, are directly related to world crude oil commodities.

The third hypothesis aims to examine the positive (significant) impact of the world gold price on the movement of the Mining Sector Index. Regression results show that the world gold price does not have effect (not significant) on the movement of the Mining Sector Index. This is not in accordance with the hypothesis that was built at the beginning, or in other words the initial hypothesis was rejected. The results of this study are in line with the results of Hutapea et al. (2016) and Sambodo (2014), which stated that the world gold price does not have effect on the Mining Sector Index. These results indicate that the gold instrument is not a substitute for mining sector stock instruments. Investors in mining stocks on the IDX do not consider the world gold price to be a significant impact on investment decisions in mining stocks. Gold is more likely to be used as a means of hedging assets owned and only used as investment diversification or as a supporting investment of the investment portfolio of investors.

V. CONCLUSION

Based on the results of the analysis and discussion in this study, the conclusions are as follows:

- The independent variables jointly impact (significant) the dependent variable and has a coefficient value of 14% which means that the Exchange Rate, World Oil Prices and World Gold Prices only affect 14% of the Mining Sector Index movements, the remaining 86% is impacted by other factors outside the study.
- The Exchange Rate variable does not effect (not significant) the movement of the Mining Sector Index. This condition shows that changes in exchange rates do not have a significant impact on changes in share prices in the mining sector.
- World Oil Price variable has a positive (significant) effect on the movement of the Mining Sector Index. This condition shows that an increase in World Oil Prices will cause the price of shares in the mining sector to increase as well, so that it will automatically cause the Mining Sector Index to move up, and vice versa.
- World Gold Price Variable does not effect (not significant) on the movement of the Mining Sector Index. This condition shows that changes in World Gold Prices do not have much impact on changes in share prices in the mining sector.

Recommendations that can be suggested by the author related to this research are:

- The ability of the variables examined in this study explains the variation in changes in the Mining Sector Index by only 14% and for further research, to further increase the value of the coefficient of determination, it is expected to take into account and add other independent variables.
- For Investors in the mining sector, it is better to pay attention to the impact of each variable in this study because information drawn from this study can be used to predict the Mining Sector Index which is then used for making the right decision in relation to investment.
- For other researchers, it is expected to extend the observation period, for example to 10 years in order to have better data distribution.

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